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ABSTRACT

The meta-analysis method was used to summarize the findings of 23 studies of the word learning process that had used imagery as an independent variable as either an "imposed" or an "induced" condition. Imposed imagery investigations compared word recall on the basis of the imagery attribute of a word, while induced imagery studies compared word recall on the basis of the use of imagery as a mnemonic strategy. The results suggested that imposed and induced imagery had a great impact upon word recall. In the case of the imposed imagery investigations, high imagery words were much more easily learned than were low imagery words. Larger differences in the imagery control and repetition comparisons in the induced imagery studies suggested that mental imagery as a mnemonic strategy was quite effective. The findings imply that a meaning strategy (imagery) is a great deal more effective than rote memorization, and that the relative equivalence of sentence generation can be explained by the fact that it is a meaning producing strategy and that it probably produces an image through verbal processes. (FL)

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A Meta-Analysis of the Effects of "Imposed" and "Induced" Imagery Upon Word Recall

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The effect of imagery as a learning variable has been of interest to many researchers investigating cognitive processing and reading. Of particular interest for many has been the investigation of the effect of imagery upon word recall. The purpose of this paper has been to summarize this research using the meta-analysis approach (Glass, 1978) to determine the degree of impact of imagery upon word recall.

The investigations included in this meta-analysis used imagery as an independent variable in either of two different ways. Imagery was used either as an "imposed" or "induced" condition to affect word recall (Levin & Kaplan, 1972).

"Imposed" imagery investigations compared word recall on the basis of the imagery attribute of a word. For example, words were classified as having a high imagery evoking level (e.g., concrete-cat) or as having a low imagery evoking level (e.g., abstract-loyalty). In "imposed" imagery investigations the subject was presented lists of high and low imagery words to be learned. The subjects' recall of the high and low imagery words was then compared to find differences in amount of recall to determine the effect of imagery as a word attribute upon word learnability.

"Induced" imagery investigations compared word recall on the basis of the use of imagery as a mnemonic strategy. For example, subjects were given a word and instructed to develop a mental image as a method for learning the word. In "induced" imagery investigations the subjects' ability to learn words using imagery as a mnemonic device was compared to their ability to learn using other mnemonic strategies which included 1) reading the word for later recall (imagery-control comparisons), 2) memorization by repetition (imagery-repetition comparisons), or 3) sentence generation (imagery-sentence comparisons). The effectiveness of

the mnemonic strategies was then determined by comparing the number of words recalled by each of the methods with the imagery method.

The results from the "imposed" and "induced" imagery research can provide clues about the roles of imagery as part of the word learning process. The summarization of these two areas of research can be used to draw implications about imagery as an attribute and a mnemonic strategy in relation to the sight vocabulary acquisition process.

Procedure

The meta-analysis method (Glass, 1978) was used to summarize the findings of the 23 studies included in this paper. The meta-analysis method goes beyond the "voting approach" (e.g., comparison of the number of statistically significant findings to the number of statistically nonsignificant findings to indicate a trend) used by many synthesizers of research. In the meta-analysis method, the effect-size of the statistical finding is the unit of analysis used for summarizing the research.

Studies were initially selected on the basis of their identification by an ERIC computer search and a subsequent follow-up in their respective bibliographies. The selection criteria for actual inclusion in the meta-analysis included 1) publication in a journal, 2) the study fit either the "imposed" or "induced" imagery classification, 3) the experimental procedure appeared to resemble word learning procedures similar to those used in school settings, and 4) statistics which could be analyzed for effect-size were reported.

The effect-size metric used was the correlation ratio. The *eta* was used for analysis of variance designs, *rpb*'s for independent-sample *t*-tests, and *d*'s derived from dependent-sample *t*-tests were converted to *rpb*'s (Cohen, 1977). The correlation ratios were then combined and an

average effect-size, standard deviation, and standard error of the mean were computed. The relative size of the effect was estimated using guidelines presented by Cohen (1977). Effect-sizes were described as being either small (.10), moderate (.24), or large (.37). Finally, the means from each of the comparisons were visually compared to indicate the direction in recall performance.

Findings

Twelve studies were located that investigated the effects of "imposed" imagery upon word recall. The studies used subjects ranging in age from five to adult (n = 1,044). Twenty-two statistical analyses were generated, of which 19 were found to be statistically significant. The average effect-size for the statistically significant differences was quite large (M = .62, $S.D.$ = .20, $S.E.M.$ = .04). In all cases, recall of the high imagery words was greater than that of the low imagery words.

Seven studies were located that investigated the effects of "induced" imagery upon word recall. The studies used subjects ranging in age from seven to adult (n = 696). Twenty-three statistical analyses were generated, of which 16 were found to be statistically significant. The average effect-size for the statistically significant differences was quite large (M = .45, $S.D.$ = .12, $S.E.M.$ = .01). In all cases, the use of imagery as a mnemonic strategy produced greater recall than did the other strategies being compared.

The "induced" imagery studies were then analyzed by type of mnemonic strategy comparison. These analyses were undertaken to more clearly illustrate the role of imagery as a mnemonic strategy.

The first analysis was of 13 imagery-control comparisons. Of the 13 comparisons, 10 were found to be statistically significant. The

average effect-size for the statistically significant differences was quite large (M = .45, S.D. = .10, S.E.M. = .01).

The second analysis was of six imagery-repetition comparisons. Five of the comparisons were found to be statistically significant. The average effect-size for the statistically significant differences was again quite large (M = .50, S.D. = .11, S.E.M. = .01).

There were four imagery-sentence generation comparisons. However, only one was found to be statistically significant and its effect-size was relatively moderate (.27). In this case, imagery produced greater than did the sentence generation strategy. However, the trend, using the "voting method" approach (3 nonsignificant, 1 significant) suggests that sentence generation is generally equivalent with imagery generation. This conclusion should be viewed with caution since there were only four statistical analyses.

Conclusions

The results of this meta-analysis suggest that "imposed" and "induced" imagery had a great impact upon word recall. In the case of the "imposed" imagery investigations, high imagery words were much more easily learned than were low imagery words. An area of future research that would be of interest is the investigation of different types of instructional strategies to overcome the difficulty of learning low imagery words. This is of particular importance because the experimental learning techniques used in the investigations were analogous to the "Look-Say" method of teaching which is not particularly effective, especially since no contextual meaning is supplied. The lack of specific meaning in the low imagery words removes the use of meaning as a mnemonic cue in word recall. This was suggested in research by Powell, Hall, and Aaron (1978) who reported finding no difference in the recall

of high and low imagery words when practice generating contextual meaning was part of the word learning process.

The large differences in the imagery-control and repetition comparisons in the "induced" imagery investigations suggest that mental imagery as a mnemonic strategy is quite effective. However, the results of the imagery-sentence generation comparisons suggest that there is relatively equivalent recall, in most cases, when imagery generation is compared to a contextual generation strategy. Two points of conjecture seem to appear. First, a meaning strategy, in this case imagery, is a great deal more effective than rote memorization. Second, the relative equivalence of sentence generation may be explained by the fact that it is a meaning producing strategy and that it probably produces an image through verbal processes. Verification of these hypotheses needs to be obtained through further research comp ring imagery generation withother meaning generation strategies.

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